CLAIMS

1. An alignment method comprising:

a step of transmitting an exposure beam from a first surface side of a thin film to a second surface side and reflecting said exposure beam on a plurality of alignment marks arranged on said second surface side of said thin film and outside said thin film;

a step of detecting said exposure beam reflected on said alignment marks at said first surface side and detecting positions of said alignment marks; and

a step of obtaining position coordinates on said thin film using said detected position of said alignment marks.

2. An alignment method as set for claim 1, wherein said first surface of said thin film is a surface applied with a resist, and

said step of obtaining said position coordinates on said thin film includes a step of determining a position for drawing a mask pattern on said thin film.

3. An alignment method as set for claim 1, wherein said exposure beam is a charged particle beam, an extremely-short ultraviolet ray, an X-ray, an ultraviolet ray, a radiation and/or a visible light.

4. An alignment substrate arranged so that a surface

thereof faces a second surface of a thin film at said second surface side of said thin film, into a first surface thereof an exposure beam entering, and

comprising a plurality of alignment marks formed on said surface and reflecting said exposure beam transmitting and entering through said thin film at higher reflectance than said surface at periphery thereof.

5. An alignment substrate as set forth in claim 4, wherein said surface at periphery of said alignment marks is formed farther from said second surface of said thin film than a surface of said alignment marks.

6. An alignment substrate as set forth in claim 4, wherein said alignment marks and said surface at periphery of said alignment marks are made from different materials.

7. An alignment substrate as set forth in claim 4, wherein said exposure beam is a charged particle beam, an extremely-short ultraviolet ray, an X-ray, an ultraviolet ray, a radiation and/or a visible light.

8. A production method of a alignment substrate comprising:

a step of forming an etching stopper layer on a first substrate;

a step of forming second substrate on said etching stopper layer;

a step of a plurality of alignment marks on a part of said second substrate;

a step of performing an etching to a surface layer portion of said second substrate using said alignment marks as a mask, and forming a step between a surface of said second substrate directly below said alignment marks and a surface of said second substrate at periphery of said alignment marks;

a step of forming a resist on said alignment marks and on a part of said second substrate at periphery of said alignment marks;

a step of performing an etching to said second substrate using said resist as a mask until said etching stopper layer is exposed; and

a step of removing said resist.

9. An exposure method comprising:

a step of measuring a position coordinates of a alignment marks in a alignment substrate having a plurality of said alignment marks thereon;

a step of arranging said alignment substrate so that a surface thereof faces a second surface of a thin film at said second surface side of said thin film, on a first surface thereof a resist being made,

a step of transmitting an exposure beam from said first surface side of said thin film to said second

surface side and reflecting said exposure beam on said alignment marks;

a step of detecting said exposure beam reflected on said alignment marks at said first surface side and detecting positions of said alignment marks;

a step of determining positions for drawing a mask pattern on said resist using said detected positions of said alignment marks; and

a step of drawing said mask pattern on said resist by an exposure of a charged particle beam, an extremely-short ultraviolet ray, an X-ray, an ultraviolet ray, and/or a radiation.

10. An exposure method as set forth in claim 9, wherein said resist is not photosensitive to said exposure beam reflected on said alignment marks.

11. An exposure method as set forth in claim 9, wherein said resist is photosensitive to said exposure beam reflected on said alignment marks, and

before applying said resist on said first surface of said thin film and at a time arranging so that said thin film faces said alignment substrate, a step of forming a protective film of said thin film on a surface of said thin film arranged above said alignment marks is further included.

12. An exposure method as set forth in claim 11,

wherein said step of forming said protective film includes a step of depositing a protective film material on said thin film and a step of removing said protective film material deposited on an unnecessary portion by etching.

13. An exposure method as set forth in claim 11, wherein said step of forming said protective film includes a step of irradiating a focused ion beam at positions where said protective film is to be formed under an existence of an organic gas and forming carbon film partially.

14. An exposure method as set forth in claim 9, wherein said exposure beam is a charged particle beam, an extremely-short ultraviolet ray, an X-ray, an ultraviolet ray, a radiation and/or a visible light.

15. An exposure apparatus comprising:

a thin film holding means for holding a thin film applied with a resist on a first surface thereof;

an alignment substrate holding means for holding an alignment substrate having a plurality of alignment marks on a surface thereof at a second surface side of said thin film so that said second surface of said thin film faces said surface;

an alignment detecting system irradiating an exposure beam at said first surface, reflecting said

exposure beam on said alignment marks via said resist and said thin film, detecting said exposure beam reflected on said alignment marks at said first surface side, and measuring position coordinates of said alignment marks; and

a charged particle beam source, an extremely-short ultraviolet ray source, an X-ray source, an ultraviolet ray source, and/or a radiation source for drawing a mask pattern on said resist.

16. An exposure apparatus as set forth in claim 15, wherein said charged particle beam source, said extremely-short ultraviolet ray source, said X-ray source, said ultraviolet ray source, and/or said radiation for drawing said mask pattern are also used for irradiation of said exposure beam of said alignment detecting system which is a charged particle beam, an extremely-short ultraviolet ray, an X-ray, an ultraviolet ray, and/or a radiation.

17. An exposure apparatus as set forth in claim 15, wherein said exposure beam is a charged particle beam, an extremely-short ultraviolet ray, an X-ray, an ultraviolet ray, a radiation and/or a visible light.

18. A production method of a mask comprising:

a step of applying a resist on a first surface of a thin film;

a step of arranging an alignment substrate having a plurality of alignment marks on a surface thereof at a second surface side of said thin film so that said second surface of said thin film faces said surface;

a step of transmitting an exposure beam from said first surface side of said thin film to said second surface side and reflecting said exposure beam on said alignment marks;

a step of detecting said exposure beam reflected on said alignment marks at said first surface side and detecting positions of said alignment marks;

a step of determining positions for drawing a mask pattern on said resist using said detected positions of said alignment marks;

a step of drawing said mask pattern on said resist by an exposure of a charged particle beam, an extremely-short ultraviolet ray, an X-ray, an ultraviolet ray, and/or a radiation;

a step of developing said resist;

a step of performing an etching to said thin film using said resist as a mask and forming openings along said mask pattern; and

a step of removing said resist.

19. A production method of a mask as set forth in claim 18, wherein said resist is photosensitive to said

exposure beam reflected on said alignment marks,

before applying said resist on said first surface of said thin film and at a time arranging so that said thin film faces said alignment substrate, a step of forming a protective film of said thin film on a surface of said thin film arranged above said alignment marks is further included, and

in said step of performing said etching to said thin film, said thin film is protected from said etching by said protective film.

20. A production method of a mask as set forth in claim 18, wherein said exposure beam is a charged particle beam, an extremely-short ultraviolet ray, an X-ray, an ultraviolet ray, a radiation and/or a visible light.